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The Darkest Hour: Private Information Control and the End of Democratic Science

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ABSTRACT

The evaluation of scientific research is based on data protected by secrecy and intellectual property (*e.g.*, Elsevier Scopus or Clarivate Web of Science). The peer review process is essentially anonymous. While science has progressed thanks to public dialogue, the current evaluation system is centered on private control of information. This represents a fundamental shift from democratic to authoritarian science. Open Science may confront this change only if it is accepted as the heir, in the digital age, of the values and principles that public and democratic science has traditionally fostered in the age of printing, thus becoming the guardian of a democratic society.

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KEYWORDS

Science – Democracy – Public Communication - Intellectual Property – Academic Copyright - Evaluation of Science – Private Control of Information - Open Science

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The Darkest Hour: Private Information Control and the End of Democratic Science*

Roberto Caso

1. Democratic science, public dialogue and intellectual property

Can the scientific community be defined as democratic? Does science thrive only in a democratic society?

To answer these questions properly, it becomes essential to provide a definition of democracy, which is what two foremost scholars in this subject, Robert Merton e Michael Polanyi, have done.

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Merton elaborated his renowned theory on norms of science since the late 1930s, a period when totalitarian regimes were evident[1]. The main concept underlying it is that science flourishes in a democratic system and echoes some of its characteristics.

In his important 1942 study, Merton describes the norms of science[2]: universalism, communism (and originality [3]), disinterestedness and organized skepticism.

Universalism, which is a feature of democracy, requires scientific truth to result from the application of established impersonal criteria[4]. It is not personal status that defines the truthfulness of someone's statements, but the fact that scientists respect some predetermined criteria. Race, nationality, religious beliefs and social status are all irrelevant. A scientific career is open to anyone who can undertake it. Regardless of how imperfectly it is practiced, universalism is one of the fundamental principles of democracy.

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[1] R.K. MERTON, *Science and Social Order*, in *Philosophy of Science*, 5, 1938, 321; R.K. MERTON, *Science and Technology in a Democratic Order*, in *Journal of Legal and Political Sociology*, 1, 1942, 115, republished in R.K. MERTON, *The Sociology of Science. Theoretical and Empirical Investigations*, edited and with an introduction by N.W. STORER, Chicago and London, 1973, 267; R.K. MERTON, *Priorities in Scientific Discovery: A Chapter in the Sociology of Science*, in *American Sociological Review*, vol. 22, no. 6, Dec., 1957, 635; R.K. MERTON, *The Matthew Effect in Science*, in *Science, New Series*, vol. 159, no. 3810, Jan. 5, 1968, 56; R.K. MERTON, *The Matthew Effect in Science, II: Cumulative Advantage and the Symbolism of Intellectual Property*, in *Isis*, vol. 79, no. 4, Dec., 1988, 606.

[2] R.K. MERTON, *The Sociology of Science. Theoretical and Empirical Investigations*, *supra* note 1, at 267.

[3] Originality is discussed in the paragraph dedicated to communism.

[4] R.K. MERTON, *The Sociology of Science. Theoretical and Empirical Investigations*, *supra* note 1, at 270 ff.

> Impersonal criteria of accomplishment and not fixation of status characterize the open democratic society. Insofar as such restraints do persist, they are viewed as obstacles in the path of full democratization. Thus, insofar as laissez-faire democracy permits the accumulation of differential advantages for certain segments of the population, differentials that are not bound up with demonstrated differences in capacity, the democratic process leads to increasing regulation by political authority. Under changing conditions, new technical forms of organization must be introduced to preserve and extend equality of opportunity[5].

Communism, in its non-technical and wide meaning of communal property of goods, means that scientific progress results from social collaboration and belongs to the community.

> The communal character of science is further reflected in the recognition by scientists of their dependence upon a cultural heritage to which they lay no differential claims. Newton's remark - «If I have seen further it is by standing on the shoulders of giants» - expresses at once a sense of indebtedness to the common heritage and a recognition of the essentially cooperative and selectively cumulative quality of scientific achievement[6]. […]
>
> The communism of the scientific ethos is incompatible with the definition of technology as «private property» in a capitalistic economy. Current writings on the «frustration of science» reflect this conflict. Patents proclaim exclusive rights of use and, often, nonuse. The suppression of invention denies the rationale of scientific production and diffusion […]. Responses to this conflict-situation have varied. As a defensive measure, some scientists have come to patent their work to ensure its being made available for public use[7].

Peer acknowledgment is equally important for scientists. This explains well the norm on originality that drives the sci-

[5] *Id.*, at 273.
[6] *Id.*, at 274-275.
[7] *Id.*, at 275.

entist to assert the priority of his contribution to the progress of science. Disputes over priority indeed originate from the institutional relevance of originality.

Disinterestedness implies that scientists are only driven by the aim of searching for the truth.

Organized skepticism leads to the abeyance of any actual judgment on published results and to the critical evaluation, through logical and empirical criteria, of certain beliefs in a given time.

The communitarian aspect depends on the institutional imperative of public communication of scientific research outputs. There is some sort of balance between the originality, on the one hand, and the communism, on the other. “Competitive cooperation” of scientists precisely moves around this delicate balance.

In other words, Merton finds in universalism a principle that is shared by democratic politics and the scientific community. Merton refers to a socialist idea of democracy, which is aimed at promoting substantial equality. Another fundamental aspect of Mertonian thought is represented by the peculiar emphasis on the public nature of science. Publicity is key to the pooling of scientific research, but it also represents the prerequisite for originality. There cannot be originality unless there is memory and awareness of the state of the art. Finally, publicity becomes the vehicle to carry out organized skepticism.

From a liberal perspective, Michael Polanyi offers his own vision of scientific community and its interaction with the State[8].

In similar vein to the Mertonian reasoning, there is a clear connection between the way science is organized and the political structure of society. However, in Polanyi the main idea is that the best possible organization hinges on the spontaneous coordination of individuals who autonomously choose what problems they want to solve. In Polanyi's analysis, science and the market – archetype of an organization based on spontaneous individual initiatives – well exemplify the existence of a superior principle that imposes the respect of individuals' freedom.

> What I have said here about the highest possible co-ordination of individual scientific efforts by a process of self-coordination may recall the self-co-ordination achieved by producers and consumers operating in a market. It was, indeed, with this in mind that I spoke of "the invisible hand" guiding the co-ordination of independent initiatives to a maximum advancement of science, just as Adam Smith invoked "the invisible hand" to describe the achievement of greatest joint material satisfaction when independent producers and consumers are guided by the prices of goods in a market. I am suggesting, in fact, that the co-ordinating functions of the market are but a special case of co-ordination by mutual adjustment. In the case of science, adjustment takes place by taking note of the published results of other scientists; while in the case of the market, mutual adjustment is mediated by a system of prices broadcasting current exchange relations, which make supply meet demand.
> But the system of prices ruling the market not only transmits information in the light of which economic agents can mutually adjust their actions, it also provides them with an incentive to exercise economy in terms of money. We shall see that, by contrast, the sci-

[8] M. POLANYI, *The Republic of Science: Its Political and Economic Theory*, in *Minerva*, 1, 1962, 54, http://sciencepolicy.colorado.edu/students/envs_5100/polanyi_1967.pdf

> entist responding directly to the intellectual situation created by the published results of other scientists is motivated by current professional standards[9].

In science, every scientist should be free to choose which problem he wants to solve. The Republic of Science therefore appears like a system characterized by an indisputable association of independent initiative and this aims at an unspecified goal[10]. Spontaneous coordination requires scientific publications, where each scientist takes account of his peers' publications and reacts with his own publications[11].

No single scientist is personally responsible for the progress of science, which is conversely the result of many contributions from distinct areas of research[12].

The Republic of Science is governed and justified by the inherent respect for tradition and value of scientific contribution, but at the same time it remains dynamic because existing knowledge may be challenged by new, original results. Respect for authority and tradition and for the value of scientific contributions is counterbalanced by the wish for originality that drives progress[13].

No external authority can take the place of science in deciding its aims. Science only responds to its own authority, which arises from the mutual acknowledgement of peers. Such authority is transmitted informally from one generation to another, through participation in the scientific community. In other words, scientific method may not find an explicit explanation – as it is not entirely codified – and can be only

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[9] *Id.*, at 2.
[10] *Id.*, at 10.
[11] *Id.*, at 2.
[12] *Id.*, at 3, 8.
[13] *Id.*, at 3.

transmitted through the apprenticeship of a pupil following the lead of his master[14].

Although there are differences in terms of prestige among scientists, the authority of science really depends on the reciprocal acknowledgment of the members of its community and not on a mere hierarchical order. Public or private funding for science should be only guided by merit, determined by the scientists themselves, diverting research funds to the most prestigious areas of research[15]. Universities should be left free to compete and choose the best scientists. Universities, therefore, become the best place for scientists to assemble in secluded communities and conduct research without any actual contribution by the public, which does not have the necessary knowledge to take part in this process.

In Polanyi's metaphor, the Republic of Science is extraterritorial, as it must guarantee that its set of rules is based only on scientific merit[16]. The Hungarian scientist moved his criticism to the politics of science being outlined in the United Kingdom at that time. These politics wished the State to guide scientific research for social aims (what today is known as "third mission") particularly when, after the end of the Second World War, the expansion of universities was essentially driven by public funds[17].

The liberal approach of Polanyi rotates around the principle of autonomy. Autonomy of the individual scientist, who is free to determine his own lines of research, and autonomy of universities from the State, which merely had the role of funding the institutions that deserved it. Polanyi does not

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[14] *Id.*, at 8.
[15] *Id.*, at 4.
[16] *Id.*, at 7.
[17] *Id.*, at 6.

mention the word "democracy" but uses instead the term "republic". Consequently, science only responds to science.

Despite the obvious differences in terms of ideological perspective and understanding of democracy, Merton e Polanyi's theories share some important similarities.

a) Norms of science are informal.

b) There is a tension between the esteem for consolidated knowledge and criticism of it, which is aimed at targeting new and original results.

c) Scientific dialogue is public.

This last statement requires further analysis. The public nature of scientific dialogue is a fundamental aspect of the scientific community. From Gutenberg onwards, talking about public dialogue means publishing printed works. Printing reduces time and distance; it also helps accumulating scientific knowledge. Moreover, publicity through printing is an essential element of modern democracies. The democratic or republican nature of science is intimately linked to the practice of printing the outputs of scientific research.

Besides, modern science has historically developed by promoting public scientific dialogue and the printing press has played a fundamental role in the process of institutionalizing this public nature of science.

A historian of science, Paolo Rossi, effectively portrayed the progressive affirmation of the public and universal aspect of science.

> Theories had to be fully communicable and experiments continually repeatable. [...]
> In this "darkness of life", believed Leibniz, it was necessary to walk together because scientific method was more important than individual genius and the goal of philosophy was not improve the intellect of the individual but that of all men. [...]

> It was inevitable that over the course of seventeenth century the battle in favor of a universal knowledge the could be comprehended by everyone shifted from the level of ideas and projects of the intellectual to those of the institution. […][18]

Among the richest analyses of this process of institutionalization, in which scientific academies flourished, the one by Adrian Johns deserves to be mentioned[19]. With respect to the practices of the Royal Society and the activities of printing and editing the first modern scientific periodical – the Philosophical Transactions was first published in 1665 – Johns describes the following.

> In practice, every experiment was a nexus between the reading of some texts and the writing and printing of others. […]
> Experimenting with print as well as with nature, the experimentalists created the distant origins of peer review, journals, and archives—the whole gallimaufry that is often taken as distinctive of science, and that is now in question once again in the age of open access and digital distribution. Above all, they gave rise to the central position that scientific authorship and its violation would hold in the enterprise. […]
> For facts to count, they supposedly had to be witnessed by an audience—ideally on repeated occasions. Their registration was therefore part and parcel of learned sociability. And their reading too was consequently not a private act, in principle, but a social gesture. […]
> In the Society itself, however, four relatively discrete stages characterized and shaped the conduct of reading. I have called these presentation, perusal, registration, and publication (which might well take place via correspondence rather than print)[20].

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[18] P. ROSSI, *The Birth of Modern Science*, translated by C. DE NARDI IPSEN, Oxford, 200, 24, 25.

[19] A. JOHNS, *Piracy. The Intellectual Property Wars from Gutenberg to Google*, Chicago and London, 2009.

[20] *Id.*, at 59-61.

Therefore, the printing press as an instrument of public dialogue also had its effects on the intellectual property of scientists. On the one hand, the press reinforced the demands for textual appropriation, while on the other hand it limited the exclusive control over the scientific results obtained by the scientist.

Concerning the former aspect, the words of Walter Ong may be recalled here [21].

> Print encourages a sense of closure, a sense that what is found in a text has been finalized, has reached a state of completion. This sense affects literary creations and it affects analytic philosophical or scientific work[22].
> Print culture gave birth to the romantic notions of 'originality' and 'creativity', which set apart an individual work from other works even more, seeing its origins and meaning as independent of outside influence, at least ideally[23].

Regarding the latter aspect, when scientists publish a book or a scientific article, they want to establish priority on the theory described in the text, which can be roughly defined in terms of claiming the paternity of the theory itself[24]. Exclu-

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21 W.J. ONG, *Orality and Literacy. The Technologizing of the Word*, New York, 2005. From a law and literature perspective, *see* M. WOODMANSEE, P. JASZI (eds.), *The Construction of Authorship – Textual Appropriation in Law and Literature*, Durham, 1994 (3rd printing 2006).

22 *Id.*, at 129.

23 *Id.*, at 131.

24 P. ROSSI, *The Birth of Modern Science*, *supra*, note 18, at 28, "[…] after the first Scientific revolution, there was not, nor could there have been, *praise* for or a positive view of dissimulation in the scientific literature or literature about science (an observation wich, for example, still does not apply to the world of politics). To dissimulate, or not make public one's own opinions, simply implies trickery or betrayal. Scientists working as a community may indeed pledge secrecy, but the pledge is usually imposed upon them. And when restrictions are imposed, scientists inevitably protest against them or, as has occurred in more recent times, rebel outright.

sive control on information (paternity over the theory) is the result of an inevitable interaction of technology (the printing press), informal norms of the scientific community and formal rules of the laws on intellectual property (copyright and patents).

Informal norms of science essentially target acknowledgement among peers. Naming a certain theory after a scientist, winning a scientific prize (such as the Nobel) and being cited in others' works are all forms of peer acknowledgement. Mario Biagioli underlines the differences between scientific authorship according to informal norms of science and intellectual property as formally regulated by the law (copyright and patents)[25]. His theory, following the analysis offered by Merton, is that scientific authorship, according to the informal norms of science, does not concern rights but rewards, namely scientific acknowledgments (especially in terms of citations). A claim of scientific authorship is a declaration that

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The fact that "Kepler's laws" are called "Kepler's" has nothing to do with possession, and simply serves to perpetuate the memory of a great figure. For science itself, and within the scientific world, secrecy became a liability".

[25] M. BIAGIOLI, *Rights or Rewards? Changing Frameworks of Scientific Authorship*, in M. BIAGIOLI, P. GALISON (eds.), *Scientific Authorship. Credit and Intellectual Property in Science*, London-New York, 2013, 253, 260-261: "Because it is not clear what axioms one could use to define credit and responsibility in science and to determine how they should be related, it appears that those categories can be defined only in the negative, as categories that are complementary to their counterparts in IP: scientific authorship is not like IP authorship, scientific credit is not like IP rights, scientific responsibility is not like financial liability, scientific credit cannot be transferred like IP rights, and so on. […] Of course I am not saying that the people who practice science are not legal subjects, but simply that, in so far as they work as scientists, they operate in a peculiar economy in which what matters is their name (and the fact that there is a real person behind that name), not the rest of the "bundle of rights" that, as legal subjects or citizens of specific nations, they may have attached to their names"

concerns nature, not a personal utterance of the scientist. For this reason, it is not his property. The rewards connected to such claim do not originate from the State (as it is for intellectual property rights) but from a global community (science).

The formal norms of copyright impede exclusive control (monopoly) over ideas, fact and mere data of the scientific text. The laws on copyright, in fact, only afford exclusive control over the expression of the idea that flows into an original work of intellectual creation, while ideas, fact and mere data remain in the public domain. They may freely circulate and be used by many[26]. The law on patents impedes exclusive control over scientific discoveries and theories, as well as mathematical methods which do not have industrial application[27].

The printing press guarantees a potential devolution of sources of knowledge. It creates not only the conditions for copyright but also for piracy. Indeed, it may lend itself to massive reproduction that is not authorized by copyright owners[28]. The mechanisms for copyright protection have always been only partially effective, also due to their territorial

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[26] For essential references in US literature, *see* J. BOYLE, J. JENKINS, *Intellectual Property: Law & Information Society*. *Cases & Materials*, Third Edition, 2016, https://law.duke.edu/cspd/openip/, 320 ff.

[27] *See* J. BOYLE, J. JENKINS, *Intellectual Property: Law & Information Society*. *Cases & Materials*, 653 ff.

[28] *See* what Adrian Johns says regarding the unauthorized printing of the Philosophical Transactions. A. JOHNS, *Piracy. The Intellectual Property Wars from Gutenberg to Google*, *supra*, note 19, at 63: “Its success may well have depended, in fact, on the unauthorized reprints that Oldenburg ostentatiously sought to suppress. Continental philosophers responded, both to them and to his original. They embraced the initiative, and their contributions sustained the Society itself as the fervor of its local membership inevitably waned. In those terms the Philosophical Transactions proved astoundingly successful”.

nature. International intellectual property treaties may help, but they do not really impede unauthorized reproduction.

Besides, copyright law engages with printing technology through the principle of exhaustion (the right of distribution being exhausted after the first selling)[29]. According to this principle (also known as "first sale doctrine"), when the copy (material embodiment) of the intellectual work is sold, the right of its owner to control any further distribution (*e.g.* a subsequent selling) is exhausted and cannot be exercised any longer on that copy. This principle allows second-hand markets to exist, for instance for used books, but also more generally justifies the legitimacy of lending books or donating them to a library. Property over the material object that embodies the intellectual work is however the prerequisite of secluded reading, a fundamental aspect of privacy and self-determination in the individual cultural education[30].

The interaction of technology (the printing press), informal norms of science and intellectual property law change the way public debate over how science may evolve and how knowledge may pass from one generation to another.

The pressure to publish, driven by the priority rule, does not entirely extinguish the trend of private control over knowledge. As a scientist I should be able to decide whether I want to publish only some of my research results and keep other research data secret or, in the alternative, to postpone publication to obtain a competitive advantage among peers. However, I may not turn down publication entirely. Since the

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[29] A. PERZANOWSKI, J. SCHULTZ, *The End of Ownership. Personal Property in the Digital Economy*, Cambridge (MA), 2016.

[30] W.J. ONG, *Orality and Literacy. The Technologizing of the Word*, *supra* note 21, at 128.

printing revolution, dialogue among scientists and between scientists and citizens is essentially of a public nature.

"Academic copyright", to be understood not as a prerogative conferred by the State, but as an interaction of technology, informal norms of science and formal copyright law, is the prerequisite for public dialogue in the scientific community and democratic society. Their interaction is clearly complex and the friction between norms of science and copyright is often inevitable. However, copyright law may foster the free development of public debate over science. It does this by conferring an exclusive right to the author and not to the institution to which he belongs: the scientist speaks for science and not on behalf of his employer. And he does it by leaving ideas in the public domain.

The stringent relationship that connects copyright, freedom of expression, public dialogue and democracy is endorsed by both jusnaturalistic theories that justified copyright[31] and theories that justify copyright protection, based on the effects that it has on society[32].

In Italy, Maria Chiara Pievatolo has promoted a Kantian vision of copyright and public dialogue in science[33]. The author

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[31] A. DRASSINOWER, *A Rights-Based View of the Idea/ Expression Dichotomy in Copyright Law*, in *Canadian Journal of Law and Jurisprudence*, Vol. 16, January 2003. SSRN: https://ssrn.com/abstract=418685

[32] N. W. NETANEL, *Copyright and a Democratic Civil Society*, in *The Yale Law Journal*, Vol. 106, No. 2 (Nov., 1996), 283; W. FISHER, *Theories of Intellectual Property*, in S. MUNZER (*ed.*), *New Essays in the Legal and Political Theory of Property*, Cambridge, 2001, [p. 4 pdf] https://cyber.harvard.edu/people/tfisher/iptheory.pdf

[33] M.C. PIEVATOLO, *Freedom, ownership and copyright: why does Kant reject the concept of intellectual property?*, 2009, http://archiviomarini.sp.unipi.it/209/: "According to Kant, the ius reale cannot be applied to ideas, or, better, to thoughts, because they can be conceived by everyone at the same time, without depriving their authors.

makes public use of reason[34] asking the publisher to represent him in his debate with the public[35]. Only the public use of reason may enlighten people and create a community of knowledge. Socratic philosophy and modern science share the idea that a community grows and prospers by building on knowledge through public dialogue[36].

Surprising as it may seem, the ius reale protects the freedom to copy, if it is taken seriously. If a thing has been purchased in a legal transaction and the purchasers copy it by their own means, they are simply working on their legitimate private property. For the very principle of private property, it is not fair to restrain the ways in which its legitimate purchaser may use it.

For this reason, no ius reale can be opposed to the reprinter. If we see the book as a material thing, whoever buys it has the right to reproduce it: after all, it is his book. Furthermore, in Kant's opinion, we cannot derive any affirmative personal obligation from a ius reale: 16 a ius personale on someone cannot be claimed by simply purchasing some related things without obtaining his or her expressed consent.

Kant, by conceiving the book as an action, adopts a strategy based on the ius personale only. By using such a strategy, he concludes that the unauthorized printer has to be compared to an unauthorized spokesperson rather than to a thief. Therefore, it is not necessary to go beyond the Roman law tradition, by inventing a new ius reale on immaterial things."; M.C. PIEVATOLO, *I padroni del discorso. Platone e la libertà della conoscenza*, Pisa, 2003, http://bfp.sp.unipi.it/ebooks/mcpla.html; F. DI DONATO, *La scienza e la rete – L'uso pubblico della ragione nell'età del Web*, Firenze, 2009, http://www.fupress.com/archivio/pdf/3867.pdf

[34] I. KANT, *An Answer to the Question: What is Enlightenment?* (1784), in M. J. GREGOR, A. WOOD (eds.), *Practical Philosophy* (*The Cambridge Edition of the Works of Immanuel Kant*, pp. 11-22), Cambridge, 1996.

[35] I. KANT, *On the Wrongfulness of Unauthorized Publication of Books* (1785), in in M. J. GREGOR, A. WOOD (eds.), *Practical Philosophy* (*The Cambridge Edition of the Works of Immanuel Kant*, pp. 23-36), Cambridge, 1996.

[36] M.C. PIEVATOLO, *I padroni del discorso. Platone e la libertà della conoscenza*, *supra* note 33, at 35 ff., 80 ff.

2. Private control of information and authoritarian evaluation of science

When Merton and Polanyi discussed the democratic nature of science, the latter was evolving considerably. It was turning from small science to "big science". The deployment of large public funds, the increased circulation of researchers and the greater reach of publications became an important feature of big science. At the same time, intellectual property started to become increasingly relevant to scientific research[37]. Universities were becoming more organized and started to resemble enterprises, even engaged in legal battles over patent protection. There were years in which the boundaries between public and private, basic research and applied research started to fade. This phenomenon was even more obvious in the United States. In such context bibliometrics turned out to be an extraordinary profitable deal.

Eugene Garfield, a scientist but also a business man, founded the Institute of Scientific Information (ISI) in the 1960s – now property of Clarivate Analytics, a private company, destined to play a fundamental role in the governance of science.

What were the theoretical premises that brought about the foundation of the ISI enterprise? Garfield wanted to build a system of bibliographical search that would allow scientists to locate the most relevant and reliable sources, namely scientific articles and other important publications from the past[38]. The idea was to measure to what extent an article

[37] A. JOHNS, *Piracy. The Intellectual Property Wars from Gutenberg to Google*, *supra* note 19, at 401 ff.

[38] E. GARFIELD, *Citation Indexes for Science: A New Dimension in Documentation through Association of Ideas*, *Science* 15 July 1955: Vol. 122 no. 3159, 108, DOI: 10.1126/science.122.3159.108.

could be a potentially relevant source to be cited in other papers. It was necessary to build a citation index which could determine the "impact factor" of each article that appeared in a closed list of scientific journals. This idea was supported by the sociology of science and in particular by Derek De Solla Price, who measured the citation of journals to determine their importance[39].

The theoretical premise of these studies was the Mertonian theory of scientific peer acknowledgment and the fact that citations do not uniformly circulate, as they only focus on some authors who, for this reason, acquire a competitive advantage over their peers, inducing the so-called "Saint Matthew effect", which recalls the verse of the New Testament (Matthew 13: 12) that says: "For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath"[40]. It appears pertinent to note that one of the sources used by Garfield was Shepard's Citations, the citation index used by US lawyers to get a first look at the judicial precedents and understand whether a given case was followed or alternatively questioned by subsequent case law.

Among the reasons behind this idea there was the identification of a list of "core journals" to Science Citation Index (SCI). According to Jean Claude Guédon:

> Garfield's pragmatic solution to a thorny problem—namely finding ways to manage the tracing of thousands upon thousands of citations—carried with it a very large theoretical consequence. In

[39] D.J. DE SOLLA PRICE, *Networks of Scientific Papers*, *Science* 30 July 1965: Vol. 149 no. 3683, 510, DOI: 10.1126/science.149.3683.510.

[40] R. K. MERTON, *The Matthew Effect in Science*, in *Science, supra* note 1; R. K. MERTON, *The Matthew Effect in Science, II: Cumulative Advantage and the Symbolism of Intellectual Property*, *supra* note 1.

merging all sorts of little specialty cores that had been culled from the coverage of leading bibliographies, and from interviews of many key scientists, Garfield, in effect, gave substance and reality to a new notion, that of "core journals" for "core science". What used to be a useful tool to assist in making difficult choices had become a generic concept with universal claims. "Core science" suddenly existed and it could be displayed by pointing to a specific list of publications[41].

The ISI developed some of the criteria to identify this list, but most of all it created a new index that made the concept of "impact factor" official, which Garfield had already mentioned in 1955. Garfield defines the Impact Factor (IF) as the measure of the frequency of citation of the "average article" in a journal in a particular year or period[42].

Identifying the journals considered to be core has also had an impact on the choices of libraries which may not buy all sources of literature for obvious reasons of limited budget. The ISI played a fundamental role in influencing the library choices on subscriptions depending on the SCI or IF.

According to classic heterogenesis of intents, universities and research centers started using IF to evaluate their own researchers[43].

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[41] J.C. GUÉDON, *In Oldenburg's Long Shadow: Librarians, Research Scientists, Publishers, and the Control of Scientific Publishing*, Association of Research Libraries, 2001, 20http://www.arl.org/storage/documents/publications/in-oldenburgs-long-shadow.pdf

[42] E. GARFIELD, *The Impact Factor*, in *Current Contents*, 1994, 25, 3-4, on the Web site of Clarivate Analytics at: https://clarivate.com/essays/impact-factor/

[43] J.C. GUÉDON, *In Oldenburg's Long Shadow: Librarians, Research Scientists, Publishers, and the Control of Scientific Publishing*, *supra* at 21: "Research centers and universities commonly use journal impact factors. Although pertaining to periodicals, this indicator finds itself applied to the case of individual scientists' performance, simply because the figures are

They began evaluating researchers who published in journals with a high IF and consequently researchers reacted by publishing in these journals too. Bibliometrics had at that time become an instrument of evaluation, a rule, rather than an instrument of research[44]. A rule characterized by mathematics and statistics.

The inner mechanism of citation databases and the measures associated with them has given considerable power to ISI in terms of evaluation, only recently joined by other

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published and, therefore, readily available [...]. However, this lazy approximation undermines the very meaning of the exercise. The quantitative side of impact factors connotes objectivity, of course. To some people, particularly science administrators, this connotation seems to be more important than the appropriateness of the method because it allows them to generate powerful forms of judgmental rhetoric. It also keeps everyone mesmerized on journal titles and relegates articles into the background. As we shall see, the interest of commercial publishers is to keep pushing journal titles, and not individual articles, as they are the foundation for their financially lucrative technique of branding individual scientists".

[44] G. LONGO, *Science, Problem Solving and Bibliometrics*, in W. BLOCKMANS, L. ENGWALL, D. WEAIRE, (eds.), *Proceedings. Bibliometrics: Use and Abuse*, in the *Review of Research Performance*, London: Portland Press, 2014, available at *Roars*, 19 October 2013, https://www.roars.it/online/science-problem-solving-and-bibliometrics/: "Bibliometrics is the apparently "democratic" analog of the Church's dominating metaphysics in the XVIIth century or the Party's truth in the SU. These rulers were not elected, but other majority rulers were elected, such as Hitler or Salazar. It suffices then to kill the opposing ideas and democracy looses its meaning – and science disappears, like in Germany after 1933. The majority vote, per se, is not democracy. Democracy requires also and crucially the enablement or even the promotion of a thinking and active minority. Bibliometrics forbids minority thinking, where new scientific ideas always occur by definition, as history teaches us. If a scientist has to write on top of his/her CV his/her bibliometric indices, that is the evaluation by the majority of scientists of his/her work, and present it in all occasions, this will prevent the search for a different approach, to dare to explore a new path that may require 60, 20 or 10 years to be quoted [...]".

similar companies. Furthermore, core journals made the market in scientific publications essentially an oligopoly. The oligopolistic structure of this market depends on the fact that researchers want to publish in journals with higher IF and libraries, also under pressure from researchers (who are not directly responsible for their cost) tend to buy such subscriptions. This inevitably renders demand inelastic, which means that it does not increase or decrease according to a rise or fall in price, consequently creating barriers to entering the market and favoring mainly the big players in the publishing market[45]. These big publishers are clearly aware of the desirability of such a market and their profits have objectively proved to be increasing, which also facilitated mergers and acquisitions which considerably augmented their economic power. The market in scientific publications, in other words, is less than competitive and is marked instead by a high level of confluence.

During the 1960s, an era still dominated by traditional printing press, the power of evaluation became concentrated in the hands of a small number of private companies, which built a complex system of secrecy and intellectual property protection around their business of distributing digital databases[46]. Private control over scientific databases is essentially

[45] M. DEWATRIPON ET. AL., *Study on the economic and technical evolution of the scientific publication markets in Europe* [Final Report – January 2006], http://ec.europa.eu/research/science-society/pdf/scientific-publicationstudy_en.pdf; G.B. RAMELLO, *Copyright & Endogenous Market Structure: A Glimpse from the Journal Publishing Market* (July 21, 2010), *Review of Economic Research on Copyright Issues*, Vol. 7, No. 1, 7, 2010, SSRN: http://ssrn.com/abstract=1646643

[46] V. LARIVIÈRE, S. HAUSTEIN, P. MONGEON, *The Oligopoly of Academic Publishers in the Digital Era*, PLOS ONE, 10(6) 2015, p.e0127502,

characterized by the interaction of intellectual property law, contracts and technological protection measures (TPMs)[47]. Because of this control over information, big oligopolistic enterprises based their commercial models on "bundling" subscriptions and "price discrimination". Indeed, the consequences of such centralized power of controlling sources of information and evaluation based on bibliometrics do not merely have an economic effect. The whole infrastructure of sources of scientific information is moving from the hands of scientific institutions and libraries into the hands of big market players.

However, this power of evaluation would not have existed without an alliance with some members of the scientific community, also known as the "gatekeepers", namely mem-

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http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0127502

[47] J.C. REICHMAN, R. OKEDIJI, *When Copyright Law and Science Collide: Empowering Digitally Integrated Research Methods on a Global Scale*, 96 *Minnesota Law Review* 1362 (2012), Minnesota Legal Studies Research Paper 12-54. SSRN: http://ssrn.com/abstract=2149218, 1369: "Since the 1990s, in particular, there has been an unprecedented extension of copyright law and related rights protecting both literature and collections of data into the realm of basic science, with no adequate exceptions for research as such. […] For example, global copyright laws automatically confer exclusive proprietary rights on authors of scientific literature, who routinely transfer those rights to commercial publishers. Database protection laws, now enacted in more than fifty-five countries, simultaneously endow compilers and publishers (as assignees) with exclusive rights to the very data that copyright laws traditionally left unprotected. Publishers, in turn, surround both scientific data and literature with a variety of technological protection measures (TPMs)—so-called electronic fences and digital locks—that cannot be penetrated or pried open even for purposes of scientific research without violating global norms rooted in an array of multilateral, regional, and bilateral treaties, as well as in a host of national legislative and regulatory instruments".

bers of scientific boards, editors and reviewers of the journals who are mostly playing the game of evaluations[48].

Subsequently, this game started to exert leverage on the anonymous nature of peer review and, later, essentially filtered scientific publications[49]. In its many variables, anonymous peer review clashes with the public nature of scientific dialogue, conversely creating a strict hierarchy. Essentially, oligopolies which go hand in hand with oligarchies.

In closing this paragraph, it seems useful to draw some conclusions. Private control over information is, within the system of research evaluation, the instrument to concentrate "governance" powers and, consequently, lessen the democratic value of science.

In the market environment, private control of information endorses oligopolistic powers. Whether following in the footsteps of ISI or concerning the new Internet intermediaries such as Google, or scientific social networks like Academia.edu e ResearchGate – which sell private information in exchange for personal data – what really matters is to maintain

[48] J. C. GUÉDON, *In Oldenburg's Long Shadow: Librarians, Research Scientists, Publishers, and the Control of Scientific Publishing*, *supra* at 32.

[49] K. FITZPATRICK, *Planned Obsolescence. Publishing, Technology, and the Future of the Academy*, New York, 2011, 15 ff., 27 ff. At 23: "On the one hand, peer review has its deep origins in state censorship, as developed through the establishment and membership practices of state-supported academies, and, on the other, peer review was intended to augment the authority of a journal's editor rather than assure the quality of a journal's products". M. BIAGIOLI, *From Book Censorship to Academic Peer Review*, *Emergences: Journal for the Study of Media & Composite Cultures*, 2002, 12:1, 11-45, at 5: "So while peer review is now cast as a sign of the hard-won independence of science from socio-political interests, it actually developed as the result of royal privileges attributed to very few academies to become part and parcel of the book licensing and censorship systems".

exclusive control over data that measure the indexes of evaluation.

3. Open Science as public and democratic science

Open Science (OS) is an umbrella term which encompasses many phenomena, including open software, open access publications, open research data and research reproducibility, open education (open access to educational resources), open peer review (namely the set of procedures that, in different ways, affirms the principle of public peer review) and the use of evaluation metrics based on open data, the process of engaging citizens in obtaining scientific results ("citizen science")[50].

The foundations of OS can be identified in two aspects of the process of public creation of science.

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[50] S. BEZJAK ET. AL., *The Open Science Training Book*, 2018, https://open-science-training-handbook.gitbooks.io/book/content/; R. CASO, *Scienza aperta*, The Trento Law and Technology Research Group. Research Papers Series; nr. 32, Trento, 2017, https://iris.unitn.it/handle/11572/183528#.WqlWf73OUfM; B. FECHER, S. FRIESIKE, *Open Science: One Term, Five Schools of Thought*, in S. BARTLING, S. FRIESIKE (eds.), *Opening Science. The Evolving Guide on How the Internet is Changing Research, Collaboration and Scholarly Publishing*, Cham - Heidelberg – New York - Dordrecht – London, Springer, 2014, 17, https://link.springer.com/chapter/10.1007%2F978-3-319-00026-8_2; P. SUBER, *Open Access*, Cambridge (Mass.), 2012, https://mitpress.mit.edu/sites/default/files/9780262517638_Open_Access_PDF_Version.pdf; The ROYAL SOCIETY, *Science as Open Enterprise*, 2012, https://royalsociety.org/~/media/policy/projects/sape/2012-06-20-saoe.pdf; M. NIELSEN, *Reinventing Discovery. The New Era of Networked Science*, New Jersey, 2011; J. WILLINSKY, *The Access Principle. The Case for Open Access to Research and Scholarship*, Cambridge (MA), 2006, http://wiki.lib.sun.ac.za/images/0/03/The-access-principle.pdf

The former is the free and open access, through the Web, to scientific and educational resources. Open access means granting the public some rights, such as the right of reproduction, the right to create derivative works, the right of distribution and the right of communication to the public.

The latter is the transparency, through the Web, of the evaluation procedure and of the control over the production of scientific output.

In modern times, a fortunate concurrence of political, economic and technological factors has made the emergence of public (open) science possible. However, the institutional structure of public science – which features the interaction of technology, informal norms and formal norms –has been very fragile since the outset [51]. As illustrated in the previous para-

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[51] P. DAVID, *The Historical Origins of "Open Science". An Essay on Patronage, Reputation and Common Agency Contracting in the Scientific Revolution*, Stanford SIEPR Discussion Papers 06-038, December 2007: http://siepr.stanford.edu/papers/pdf/06-38.pdf, at 5: "Considered at the macro-level, "open science" and commercially oriented R&D based upon proprietary information together form a complementary pair of institutionally distinct sub-systems. The public policy challenge that needs to be faced, consequently, is to keep the two sub-systems in proper productive balance, so that the special capabilities of each may amplify the productivity of the other. But the former of these sub-systems, being based on cooperative behavior of researchers who are dependent on public and private patronage support for their work, is the more fragile of the pair; and the more likely to be undermined by the incursion of information disclosure restrictions motivated by the goal of privately appropriating rents from possession of new scientific and technical information. The "balancing act" for public policy therefore requires more than maintenance of adequate public funding for open science institutions and programs. It may call for deliberate measures to halt, and in some areas even reverse excessive incursions of claims to private property rights over material that would otherwise remain in the public domain of scientific data and information – in other words, for the protection of an "open science domain" from the regime of legal protections for intellectual property rights".

graphs, private control over information may downsize or even destroy public and democratic science.

In this period of history, private control over information strongly prevails and the actual survival of Open Science (*i.e.*, public and democratic science) is at risk. This is confirmed by the fact that large commercial databases have invaded a considerable part of Open Access.

Elsevier, for instance, not only charges for OA, but is currently buying some repositories and digital infrastructure of OA such as the "Social Science Research Network" and "bepress". At the same time, scientific commercial social networks like Academia.edu appear to be increasingly aggressive players in the market[52]. Scientific researchers, on the contrary, seem more interested in choosing commercial platforms rather than using the infrastructures that exists in the academic institutional or nonprofit world. This is the case, even though scientific social networks share the same negative aspects shared by any other social networks, for example regarding the appropriation and exploitation of personal data of users[53].

These instances prove that, in contrast to what many think of Open Science (*i.e.* public and democratic science) as an inescapable destiny, there are some counteracting forces at work.

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[52] J. POOLEY, *Scholarly communications shouldn't just be open, but non-profit too*, August 15, 2017, http://blogs.lse.ac.uk/impactofsocialsciences/2017/08/15/scholarly-communications-shouldnt-just-be-open-but-non-profit-too/

[53] K. FORTNEY, J. GONDER, *A social networking site is not an open access repository*, December 1, 2015, http://osc.universityofcalifornia.edu/2015/12/a-social-networking-site-is-not-an-open-access-repository/.

1) "Centralization of the private control of information on the Web". The dream of an open and democratic Web clashes with the reality of today's Web, which is dominated by big commercial platforms and public agencies which do not really operate for the sake of the public good[54].

2) "Automated decisions". Centralization of the private control of information matches the idea of substituting human decisions with algorithms and software. In its most extreme form this paradigm predicts the substitution of human science with the science of machines. Applying mathematics and statistics to large quantity of data ("big data") would allow identifying correlations among different phenomena, with no need to turn to the classical scientific method based on hypothesis and theoretical models that can be subject to falsifiability [55].

3) "Increasingly wide intellectual property laws"[56]. In particular, databases protection laws and TPMs distort copyright and make it closer to a perilous ownership of information.

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[54] T. BERNERS LEE, *Long Live the Web*, in *Scientific American*, 2010, 80.

[55] C. ANDERSON, *The End of Theory: The Data Deluge Makes the Scientific*, in *Wired*, June 27 2008, https://www.wired.com/2008/06/pb-theory/https://www.wired.com/2008/06/pb-theory/. For some fundamental criticisms on Anderson's perspective *see* C. S. CALUDE, G. LONGO, *The Deluge of Spurious Correlations in Big Data*, in *Foundations of Science*, 2017, vol. 22, Issue 3, 595.

[56] J.C. REICHMAN, R. OKEDIJI, *When Copyright Law and Science Collide: Empowering Digitally Integrated Research Methods on a Global Scale*, *supra* note 46, at 1477: "A top priority for policymakers should be to avoid generating legally established fiefdoms, in which a few private rights holders can combine the bulk of all scientific data and literature into monopolized repositories where access and use are restricted and controlled from the top down, and in which the commodified inputs of publicly funded science are distributed on a proprietary basis".

4) "Commercialization of science and university". The transformation of universities into enterprises dates back to the past few decades. However, this process has recently accelerated greatly[57]. Universities make strategic use of intellectual property and behave as the main actors in the technology market. The distinction between basic research and applied research seems to fade. Research funding appears to be often project-based and linked to short term results. Further, research funding becomes temporary and unstable, which reduces the autonomy and the freedom of researchers, particularly younger researchers whom we should expect to pursue new ideas. Informal norms of science change, their operational relevance is reduced and they are replaced by formal norms of different kinds. Language and categories of the institution change, together with the dominion of "quality assurance". Commercialization is accompanied by competition to the detriment of cooperation among scientists. One of the collateral effects of this exacerbation of competition is the exponential grow of scientific misconduct[58].

5) "A less democratic society". The transition from the government by laws to the governance of numbers describes the crisis of Western democracy well [59]. What seems to be a relentless transformation of democracy into a "soft authoritari-

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[57] *See*, *e.g.*, E. SCHRECKER, *The Lost Soul of Higer Education, Corporatization, The Assault on Academic Freedom, and the End of American University*, New York-London, 2010; H. RADDER (ed.), *The Commodification of Academic Research*, Pittsburgh Pa., 2010.

[58] M.A. EDWARS, S. ROY, *Academic Research in the 21st Century: Maintaining Scientific Integrity in a Climate of Perverse Incentives and Hypercompetition*, in *Environmental Engineering Science*, Volume 34, Number 1, 2017, DOI: 10.1089/ees.2016.0223, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206685/

[59] A. SUPIOT, *Governance by Numbers. The Making of a Legal Model of Allegiance*, London, Oxford, New York, New Deli, Sydney, 2017.

anism", namely the compression of the autonomy of science and academic freedom, is indeed a fundamental aspect of this process. As history has clearly demonstrated, authoritarianism fears democratic science because it is the perfect environment for the critical thought to develop.

To survive and hopefully further develop, Open Science must fight against all these forces.

Regarding intellectual property law, to date the petitions of Open Science have not really found their own space. On the contrary, it is unlikely that they will. This is well explained by the fact that part of the OS movement has chose civil disobedience instead, seeking a circumvention of copyright law to release scientific knowledge from exclusivity. In his famous post of 2008 titled "Guerrilla Open Access Manifesto", Aaron Swartz urged people to exchange passwords to access proprietary databases, to share papers downloaded for a fee using the peer-to-peer (P2P) technology[60]. Swartz's message found some systematic fulfillment in platforms like Sci-Hub, where an enormous quantity of scientific publications is available.

Civil disobedience diminishes private control over information but does not really solve the problem. It is necessary rather to discuss the predicament of the evaluation systems that are currently ruling.

Open Science may help in hindering the centralization of evaluation powers only if it becomes aware of the fact that, in the digital age, it has inherited all the values and principles that public and democratic science traditionally fostered in the analogue age. This also means that Open Science repre-

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[60] A. SWARTZ, *Guerrilla Open Access Manifesto*, July 2008, Eremo, Italy, https://archive.org/stream/GuerillaOpenAccessManifesto/Goamjuly2008_djvu.txt

sents one of the most important strongholds of a truly democratic society.

References

C. ANDERSON, *The End of Theory: The Data Deluge Makes the Scientific*, in *Wired*, June 27 2008, https://www.wired.com/2008/06/pb-theory/https://www.wired.com/2008/06/pb-theory/

T. BERNERS LEE, *Long Live the Web*, in *Scientific American*, 2010, 80

S. BEZJAK ET. AL., *The Open Science Training Book*, 2018, https://open-science-training-handbook.gitbooks.io/book/content/

M. BIAGIOLI, *Rights or Rewards? Changing Frameworks of Scientific Authorship*, in M. BIAGIOLI, P. GALISON (eds.), *Scientific Authorship. Credit and Intellectual Property in Science*, London-New York, 2013, 253

M. BIAGIOLI, *From Book Censorship to Academic Peer Review*, *Emergences: Journal for the Study of Media & Composite Cultures*, 2002, 12:1, 11-45

J. BOYLE, J. JENKINS, *Intellectual Property: Law & Information Society. Cases & Materials*, Third Edition, 2016, https://law.duke.edu/cspd/openip/

R. CASO, *Scienza aperta*, The Trento Law and Technology Research Group. Research Papers Series; nr. 32, Trento, 2017, https://iris.unitn.it/handle/11572/183528#.WqlWf73OUfM

C.S. CALUDE, G. LONGO, *The Deluge of Spurious Correlations in Big Data*, in *Foundations of Science*, 2017, vol. 22, Issue 3, 595, http://www.di.ens.fr/users/longo/files/BigData-Calude-LongoAug21.pdf

P. DAVID, *The Historical Origins of "Open Science". An Essay on Patronage, Reputation and Common Agency Contracting in the Scientific Revolution*, Stanford SIEPR Discussion Papers 06-038, December 2007: http://siepr.stanford.edu/papers/pdf/06-38.pdf

D.J. DE SOLLA PRICE, *Networks of Scientific Papers*, *Science* 30 July 1965: Vol. 149 no. 3683, 510, DOI: 10.1126/science.149.3683.510

M. DEWATRIPON ET. AL., *Study on the economic and technical evolution of the scientific publication markets in Europe* [Final Report – January 2006], Commissioned by DG-Research, European Commission http://ec.europa.eu/research/science-society/pdf/scientific-publicationstudy_en.pdf

F. DI DONATO, *La scienza e la rete – L'uso pubblico della ragione nell'età del Web*, Firenze, 2009, http://www.fupress.com/archivio/pdf/3867.pdf

A. DRASSINOWER, *A Rights-Based View of the Idea/ Expression Dichotomy in Copyright Law*, in *Canadian Journal of Law and Jurisprudence*, Vol. 16, January 2003. SSRN:

https://ssrn.com/abstract=418685

M.A. EDWARS, S. ROY, *Academic Research in the 21st Century: Maintaining Scientific Integrity in a Climate of Perverse Incentives and Hypercompetition*, in *Environmental Engineering Science*, Volume 34, Number 1, 2017, DOI: 10.1089/ees.2016.0223, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206685/

B. FECHER, S. FRIESIKE, *Open Science: One Term, Five Schools of Thought*, in S. BARTLING, S. FRIESIKE (eds.), *Opening Science. The Evolving Guide on How the Internet is Changing Research, Collaboration and Scholarly Publishing*, Cham - Heidelberg – New York - Dordrecht – London, Springer, 2014, 17, https://link.springer.com/chapter/10.1007%2F978-3-319-00026-8_2

W. FISHER, *Theories of Intellectual Property*, in S. MUNZER (ed.), *New Essays in the Legal and Political Theory of Property*, Cambridge, 2001, https://cyber.harvard.edu/people/tfisher/iptheory.pdf

K. FITZPATRICK, *Planned Obsolescence. Publishing, Technology, and the Future of the Academy*, New York, 2011

K. FORTNEY, J. GONDER, *A social networking site is not an open access repository*, December 1, 2015, http://osc.universityofcalifornia.edu/2015/12/a-social-networking-site-is-not-an-open-access-repository/

E. GARFIELD, *Citation Indexes for Science: A New Dimension in Documentation through Association of Ideas*, *Science* 15 July 1955: Vol. 122 no. 3159, 108, DOI: 10.1126/science.122.3159.108

J.C. GUÉDON, *In Oldenburg's Long Shadow: Librarians, Research Scientists, Publishers, and the Control of Scientific Publishing*, Association of Research Libraries, 2001, http://www.arl.org/storage/documents/publications/in-oldenburgs-long-shadow.pdf

A. JOHNS, *Piracy. The Intellectual Property Wars from Gutenberg to Google*, Chicago and London, 2009

I. KANT, *On the Wrongfulness of Unauthorized Publication of Books* (1785), in in M. J. GREGOR, A. WOOD (eds.), *Practical Philosophy* (*The Cambridge Edition of the Works of Immanuel Kant*, pp. 23-36), Cambridge, 1996

I. KANT, *An Answer to the Question: What is Enlightenment?* (1784), in M. J. GREGOR, A. WOOD (eds.), *Practical Philosophy* (*The Cambridge Edition of the Works of Immanuel Kant*, pp. 11-22), Cambridge, 1996

V. LARIVIÈRE, S. HAUSTEIN, P. MONGEON, *The Oligopoly of Academic Publishers in the Digital Era*, PLOS ONE, 10(6) 2015, p.e0127502, http://journals.plos.org/plosone/article?id=10.1371/journal.

pone.0127502

G. LONGO, *Science, Problem Solving and Bibliometrics*, in W. BLOCKMANS, L. ENGWALL, D. WEAIRE, (eds.), *Proceedings. Bibliometrics: Use and Abuse*, in the *Review of Research Performance*, London: Portland Press, 2014, available at *Roars*, 19 October 2013, https://www.roars.it/online/science-problem-solving-and-bibliometrics/

R.K. MERTON, *The Matthew Effect in Science, II: Cumulative Advantage and the Symbolism of Intellectual Property*, in *Isis*, vol. 79, no. 4, December 1988, 606

R.K. MERTON, *The Matthew Effect in Science*, in *Science, New Series*, vol. 159, no. 3810, Jan. 5, 1968, 56

R.K. MERTON, *Priorities in Scientific Discovery: A Chapter in the Sociology of Science*, in *American Sociological Review*, vol. 22, no. 6, Dec., 1957, 635

R. K. MERTON, *Science and Technology in a Democratic Order*, in *Journal of Legal and Politcal Sociology*, 1, 1942, 115, republished in R.K. MERTON, *The Sociology of Science. Theoretical and Empirical Investigations*, edited and with an introduction by N.W. STORER, Chicago and London, 1973, 267

R.K. MERTON, *Science and Social Order*, in *Philosophy of Science*, 5, 1938, 321

N.W. NETANEL, *Copyright and a Democratic Civil Society*, in *The Yale Law Journal*, Vol. 106, No. 2 (November 1996), 283

M. NIELSEN, *Reinventing Discovery. The New Era of Networked Science*, New Jersey, 2011

W.J. ONG, *Orality and Literacy. The Technologizing of the Word*, New York, 2005

A. PERZANOWSKI, J. SCHULTZ, *The End of Ownership. Personal Property in the Digital Economy*, Cambridge (MA), 2016

M.C. PIEVATOLO, *Freedom, ownership and copyright: why does Kant reject the concept of intellectual property?*, 2009, http://archiviomarini.sp.unipi.it/209/

M.C. PIEVATOLO, *I padroni del discorso. Platone e la libertà della conoscenza*, Pisa, 2003, http://bfp.sp.unipi.it/ebooks/mcpla.html

M. POLANYI, *The Republic of Science: Its Political and Economic Theory*, in *Minerva*, 1, 1962, 54, http://sciencepolicy.colorado.edu/students/envs_5100/polanyi_1967.pdf

J. POOLEY, *Scholarly communications shouldn't just be open, but non-profit too*, August 15, 2017, http://blogs.lse.ac.uk/impactofsocialsciences/2017/08/15/scholarly-communications-shouldnt-just-be-open-but-non-profit-too/

H. RADDER (ed.), *The Commodification of Academic Research*, Pittsburgh Pa., 2010

G.B. RAMELLO, *Copyright & Endogenous Market Structure: A Glimpse from the Journal Publishing Market* (July 21, 2010), *Review of Economic Research on Copyright Issues*, Vol. 7, No. 1, 7, 2010, SSRN: http://ssrn.com/abstract=1646643

J.C. REICHMAN, R. OKEDIJI, *When Copyright Law and Science Collide: Empowering Digitally Integrated Research Methods on a Global Scale*, 96 *Minnesota Law Review* 1362 (2012), Minnesota Legal Studies Research Paper 12-54. SSRN: http://ssrn.com/abstract=2149218

P. ROSSI, *The Birth of Modern Science*, translated by C. DE NARDI IPSEN, Oxford, 2001

E. SCHRECKER, *The Lost Soul of Higer Education, Corporatization, The Assault on Academic Freedom, and the End of American University*, New York-London, 2010

P. SUBER, *Open Access*, Cambridge (Mass.), 2012, https://mitpress.mit.edu/sites/default/files/9780262517638_Open_Access_PDF_Version.pdf

A. SUPIOT, *Governance by Numbers*. *The Making of a Legal Model of Allegiance*, London, Oxford, New York, New Deli, Sydney, 2017

A. SWARTZ, *Guerrilla Open Access Manifesto*, July 2008, Eremo, Italy, https://archive.org/stream/GuerillaOpenAccessManifesto/Goamjuly2008_djvu.txt

THE ROYAL SOCIETY, *Science as Open Enterprise*, 2012, https://royalsociety.org/~/media/policy/projects/sape/2012-06-20-saoe.pdf

J. WILLINSKY, *The Access Principle. The Case for Open Access to Research and Scholarship*, Cambridge (MA), 2006, http://wiki.lib.sun.ac.za/images/0/03/The-access-principle.pdf

M. WOODMANSEE, P. JASZI (eds.), *The Construction of Authorship – Textual Appropriation in Law and Literature*, Durham, 1994 (3rd printing 2006)

The Trento Lawtech Research Paper Series is published since Fall 2010

1. **Giovanni Pascuzzi**, L'insegnamento del diritto comparato nelle università italiane (aggiornamento dati: dicembre 2009) - The Teaching of Comparative Law in Italian Universities (data updated: December 2009), Trento Law and Technology Research Group Research Papers, October 2010.

2. **Roberto Caso**, Alle origini del copyright e del diritto d'autore: spunti in chiave di diritto e tecnologia - The Origins of Copyright and Droit d'Auteur: Some Insights in the Law and Technology Perspective, Trento Law and Technology Research Group Research Papers; November 2010.

3. **Umberto Izzo**, **Paolo Guarda**, Sanità elettronica, tutela dei dati personali e digital divide generazionale: ruolo e criticità giuridica della delega alla gestione dei servizi di sanità elettronica da parte dell'interessato - E-health, Data Protection and Generational Digital Divide: Empowering the Interested Party with the Faculty of Nominating a Trusted Person Acting as a Proxy when Processing Personal Health Data within an Electronic PHR, Trento Law and Technology Research Group Research Papers; November 2010.

4. **Rossana Ducato**, "Lost in Legislation": il diritto multilivello delle biobanche di ricerca nel sistema delle fonti del diritto (convenzioni internazionali, leggi europee, nazionali e regionali, softlaw) - "Lost in legislation": The Multilevel Governance of Research Biobanks and the Sources of Law (International Conventions, European, National and Regional legislations, Softlaw), Trento Law and Technology Research Group

Research Papers; December 2010.

5. **Giuseppe Bellantuono**, The Regulatory Anticommons of Green Infrastructures, Trento Law and Technology Research Group Research Papers; February 2011.

6. **Francesco Planchenstainer**, La regolamentazione dell’acqua destinata ad impiego alimentare: analisi storico comparativa dei differenti approcci sviluppati negli USA e nella UE - The Regulation Of Water For Nutritional Use: A Comparative and Historical Analysis of the Different Approaches Developed in US and EU Law, Trento Law and Technology Research Group Research Papers; April 2011.

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